

**WHAT IS CLAIMED IS:**

1. A computer-executable method for isolating a process step in a semiconductor manufacturing environment, the method comprising:
  - retrieving manufacturing information associated with a fabrication process, wherein the manufacturing information includes a plurality of process step pairs;
  - dividing the manufacturing information into at least a high group and a low group using a first statistical method;
  - calculating a value for each process step pair by applying a second statistical method to the high and low groups;
  - ranking the process step pairs based on their calculated values;
  - eliminating at least one redundant process step pair from the ranked process step pairs;
  - and
  - identifying the process step by analyzing the remaining ranked process step pairs.
2. The computer-executable method of claim 1 wherein eliminating the redundant process step pair includes calculating a referral score for each process step pair based on each process step pair's relationship with other process step pairs having the same value.
3. The computer-executable method of claim 2 wherein the referral score for a process step pair is modified if the process step pair is contained within another process step pair.
4. The computer-executable method of claim 3 further comprising ranking the process step pairs by referral score.
5. The computer-executable method of claim 3 wherein a process step pair that contains another process step pair having a higher referral score is eliminated.
6. The computer-executable method of claim 1 further comprising altering the fabrication process using the identified process step.

7. The computer-executable method of claim 1 wherein the first statistical method is a statistical clustering method.

8. The computer-executable method of claim 1 wherein the second statistical method is a non-parametric statistical method.

9. The computer-executable method of claim 1 further comprising defining a plurality of parameters for use in retrieving the manufacturing information, wherein the parameters define a step size window and a plurality of process steps that are not to be retrieved.

10. A method for automatically identifying a critical process step in a semiconductor manufacturing environment, the method comprising

partitioning manufacturing data representing process step pairs into at least a low group and a high group using a first statistical method;

obtaining a P-value for each process step pair in the manufacturing data based on the low and high groups using a second statistical method;

ranking the process step pairs based on their P-values and assigning each process step pair to a P-value group of process step pairs having identical P-values;

calculating a referral score for each process step pair within the P-value group and ranking the process step pairs within the P-value group by their referral scores; and

pruning process step pairs from the P-value group by eliminating each process step pair that contains another process step pair having a higher referral score.

11. The method of claim 10 further comprising calculating upper and lower fences based on an inter-quartile range and eliminating values lying above the upper fence and below the lower fence.

12. The method of claim 10 wherein calculating the referral score for a process step pair includes determining whether a time span occupied by the process step pair is contained within a time span occupied by another process step pair in the P-value group.

13. The method of claim 12 wherein the referral score for the process step pair is incremented if the time span occupied by the process step pair is contained within the time span occupied by another process step pair in the P-value group.

14. The method of claim 10 wherein the process step pairs are ranked in ascending order based on their P-values and are ranked in descending order based on their referral scores.

15. The method of claim 10 further comprising analyzing the pruned process step pairs to identify the critical process step.

16. The method of claim 10 further comprising:  
defining a step size window; and  
retrieving the manufacturing data using the step size window.

17. The method of claim 10 wherein the manufacturing data is retrieved from a manufacturing execution system.

18. The method of claim 10 further comprising defining at least one process step that is to be excluded from the manufacturing data.

19. The method of claim 10 wherein the first statistical method is a statistical clustering method.

20. The method of claim 19 wherein the first statistical method is a multivariate analysis of variance (MANOVA) method.

21. The method of claim 10 wherein the second statistical method is a non-parametric statistical method.

22. The method of claim 21 wherein the second statistical method is a Kruskal-Wallis method.

23. A system for retrieving information from a semiconductor manufacturing environment and identifying a critical process step based on the retrieved information, the system comprising:

- a manufacturing execution system (MES) configured to manage a plurality of process steps;

- a data query module associated with a plurality of parameters, wherein the parameters define the information to be retrieved from the MES; and

- a plurality of computer-executable instructions, including:

- instructions for partitioning manufacturing data representing process step pairs into at least a low group and a high group using a first statistical method;

- instructions for obtaining a P-value for each process step pair in the manufacturing data based on the low and high groups using a second statistical method;

- instructions for ranking the process step pairs based on their P-values and assigning each process step pair to a P-value group of process step pairs having identical P-values;

- instructions for calculating a referral score for each process step pair within the P-value group and ranking the process step pairs within the P-value group by their referral scores;
- and

- instructions for pruning process step pairs from the P-value group by eliminating each process step pair that contains another process step pair having a higher referral score.

24. The system of claim 23 wherein the instructions for calculating the referral score for a process step pair include instructions for determining whether a time span occupied by the process step pair is contained within a time span occupied by another process step pair in the P-value group.

25. The method of claim 24 wherein the referral score for the process step pair is incremented if the time span occupied by the process step pair is totally contained within the time span occupied by another process step pair in the P-value group.